Description of Deep Inhalational Sedation for Office Pediatric Dental Procedures

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Introduction

Sedation is sometimes required to facilitate dental care in children. At University Pediatric Dentistry (UPD) we provide Oral / IV moderate sedation and deep IV sedation based upon the requirements of the case. Certain procedures can be performed under deep inhalational sedation, such as tympanostomy tube placement by ENT surgeons. The advantages of a deep inhalational sedation include rapid induction and recovery of deep sedation, early discharge, and has **no** IV access required. At the UPD sedation suite we recently acquired a Drager Fabius Tiro anesthesia machine (Figure 1a), and the Anesthesiologist now offers this sedation option to the patients/parents. The aim of this prospective study is to evaluate the logistics of the procedures and outcomes of a chair-based office deep inhalational sedation for pediatric patients ages 4-12 with smaller dental treatment plans.

TABLE 1	XO	SSC	PULP	RESIN	SEAL
% CASES	66.2	61.8	27.9	27.9	11.8

Figure 1. Mask use and Monitoring

Methods

A full anesthesia setup is required: an anesthesia machine, full anesthesia monitoring (GE B40 monitor with vapor analysis and temperature), as well as a scavenging system with the HVAC designed for frequent room air exchanges. After utilizing a full mask anesthesia induction with 2/4L O_2/N_2O and 8% Sevoflurane, a small nasal mask with 6L 100% O_2 and 8% sevoflurane is used to maintain anesthesia for the procedure. The airway is supported by the anesthesiologist: chin lift, jaw thrust, assisted BMV as needed. Occasionally, full mask support may be required.

Results

We have completed over 300 cases since we started this sedation technique in March 2022. There has been a range of 7-18 cases per day. The daily average procedure and recovery times were 2.7-8.5 and 20.1-26.5 minutes respectively, during the evolution of this service. In this prospective study, we have recruited 68 patients. The percentages of each type of respective treatment performed are shown in Table 1. Extractions and SSC's were the most common procedures. The induction mask size and nasal mask size distributions, based on the patient's age, are shown in Table 2. As displayed in the table, induction mask size and nasal mask size appear to be directly correlated with the age of the patient. There is also a respiration assessment shown in Table 2. The majority of patients (i.e. 55%) presented with respiration assessment scores indicating that at least one of, if not both of, the parameters - ETCO2 tracing (Figure 1c) and/or circuit bag movement - were able to be assessed all / most of the time. The induction RASS scores were recorded and are shown in Table 3. A strong majority of patients (i.e. 66%) had a RASS score of "0" during the induction process.

TABLE 2	MASK USE		RESPIRATION ASSESSMENT		
INDUCTION MASK SIZE	NUMBER	AVERAGE AGE	ASSESSMENT NO.	ETCO2 TRACING	CIRCUIT BAG MOVEMENT
SIZE 2 (Toddler)	32	5.4	(0) ABSENT	7	8
SIZE 3 (pediatric)	35	7.7	(1) OCCASIONALLY	23	23
SIZE 4 (small adult)	1	7.0	(2) ~ 50% TIME	17	21
NASAL MASK SIZE			(3) ALL / MOSTLY	18	13
SIZE 0 (neonate)	32	5.4	BOTH ASSES 2+	ONE ASSESS 3	BOTH 3
SIZE 1 (infant)	36	7.9	30	20	17

ASSESS VENTILATION USING CAPNOGRAPHY, CIRCUIT BAG MOVEMENT (SEE ABOVE)

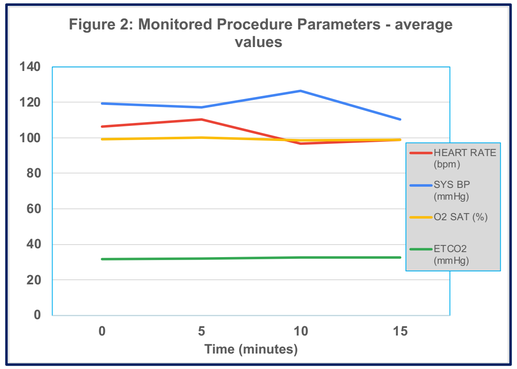
CHEST/ABDOMINAL MOVEMENT, NASAL MASK MISTING and the CHEST WALL IMPEDANCE RESPIRATORY MONITOR (figure 2C)

TABLE 3	INDUCTION BEHAVIOR
RASS INDUCTION	NUMBER
0	45
1	5
2	6
3	8
4	4

TABLE 4	NITROUS TIME	SEVOFLURANE TIME	SEDATION TIME	PROCEDURE TIME	DC TIME
OVERALL average	3.4	9.5	3.0	7.1	21.5
OVERALL SD	1.1	3.4	0.9	3.6	3.8

Result cont.

On average, cases have utilized less than 10 minutes of Sevoflurane administration, and discharge times were just over 20 minutes from the time of procedure completion (Table 4). When analyzing the patient's procedural vital signs, it appears that consistency amongst these parameters was maintained throughout the duration of the procedure (Figure 2).



Discussion

As we develop this service, the patient selection and procedures appear to be appropriate. We have expanded the size and duration of procedures over the initial 6 months, and the study results reflect our present practice. The anesthesia technique allows for procedure completion with a rapid recovery and no IV placement distress for the patient/parent. Overall, the induction process was very well tolerated, and it provided a significant benefit of avoiding the need for IV placement. This rather inexpensive form of sedation (i.e. Sevoflurane cost/patient ~ $20) does still require the presence of an anesthesiologist, as well as the expensive anesthesia machine / monitors, to deliver this sedation. Many dental offices using N_2O have enhanced room air exchange in place. Typical respiration assessment involves the anesthesiologist monitoring five variables, as shown at the base of Table 2. In most cases using the neonate / infant mask, appropriate airway monitoring was possible and even in some cases with the nasal mask, BMV was performed satisfactorily. 100% oxygen is used during the entire procedure to prevent hypoxia. It was apparent that the gauze placed by the dentist helps reduce gas leak. We feel that this sedation method has proven to be efficient, safe and effective for this select patient population.